How the Science Committee Looks at DOE's Applied R&D Portfolio

Presentation to Distributed Energy Resources Peer Review Workshop

By Kevin Carroll
Staff Director

Energy Subcommittee

2 Dec 03

Today's discussion

Wider than Peer Review under discussion today

- What we look for in the portfolio and in the programs
- How we would like to make cross-program comparisons
- Review the progress-to-date
- Some areas where we see improvement needed

The Committee Perspective

- Focused on public benefits
- Data oriented; Performance driven
  - Cost-sharing
  - Years to commercialization
  - Breadth of benefits
  - "Incidence" of benefit

Investment Criteria for Federal R&D Programs

Goal: A Balanced Portfolio

Across several dimensions:

- Time
- Public Benefits
  - Environmental
  - Economic/Energy Efficiency
  - Security
- Technical Risk
- Plausible Future Scenarios
  - Covariance between programs: one program's improved benefits offset other's reductions

Value Added from Data-oriented Performance Evaluation

- Improved effectiveness of programs
- Better management information for decision making
- Better communications with:
  - the White House
  - Congress
  - the public

The Committee Perspective:

- Public Benefits of Distributed Energy:
  - Efficiency
  - Security
  - Diversity
  - Reliability
- Science Committee has been supportive of DER for these reasons

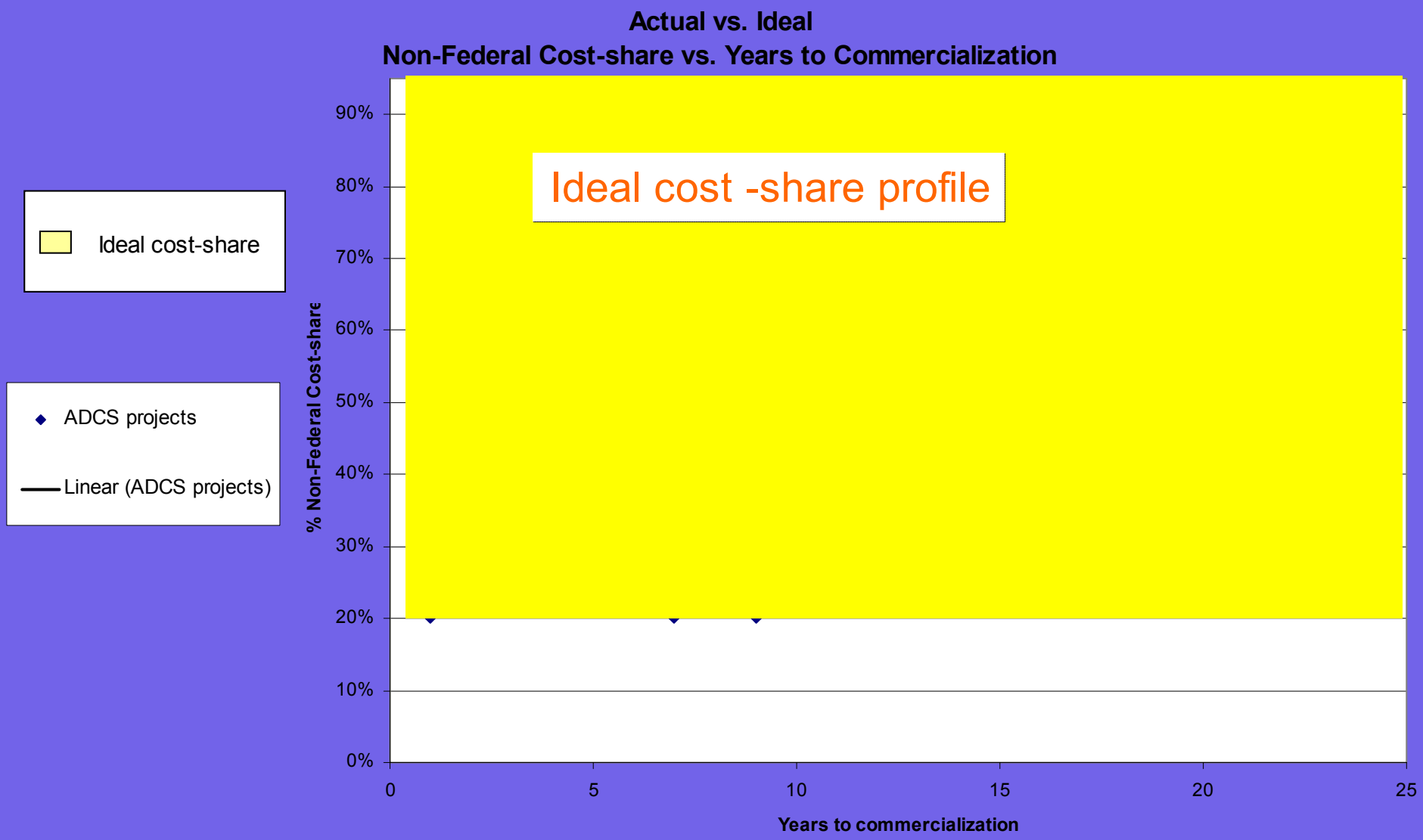
Defining the ideal portfolio

- Characteristics of the “ideal” portfolio
  - Identifies how each program contributes
    - To intended “return”: Environmental, security, economic
    - Across time, benefits, and possible price/supply scenarios
- Uses real, quantitative data as its base
- Consistent methods and clearly articulated assumptions

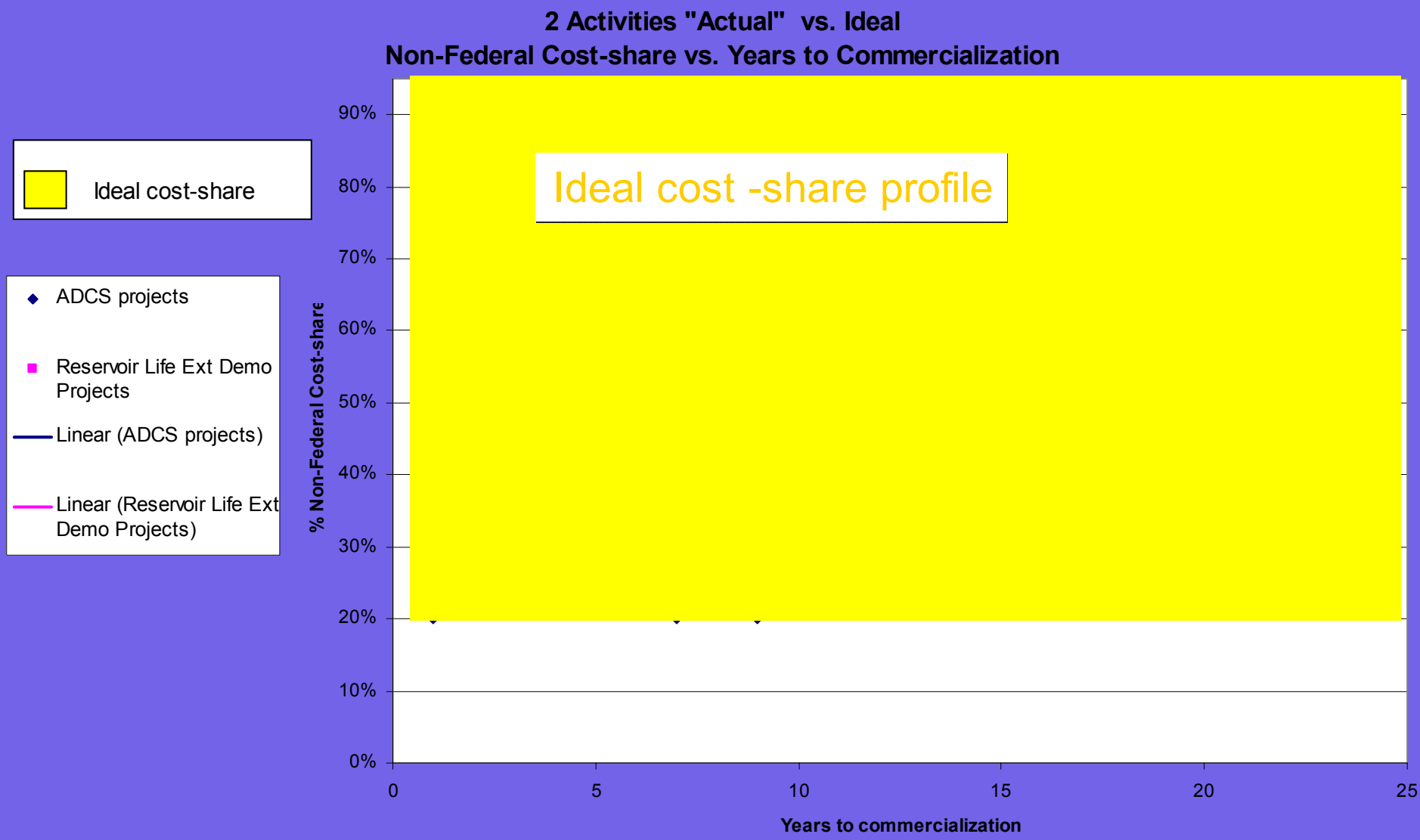
- Charts of key variables are one way to present data-rich information to management

Start with the Ideal

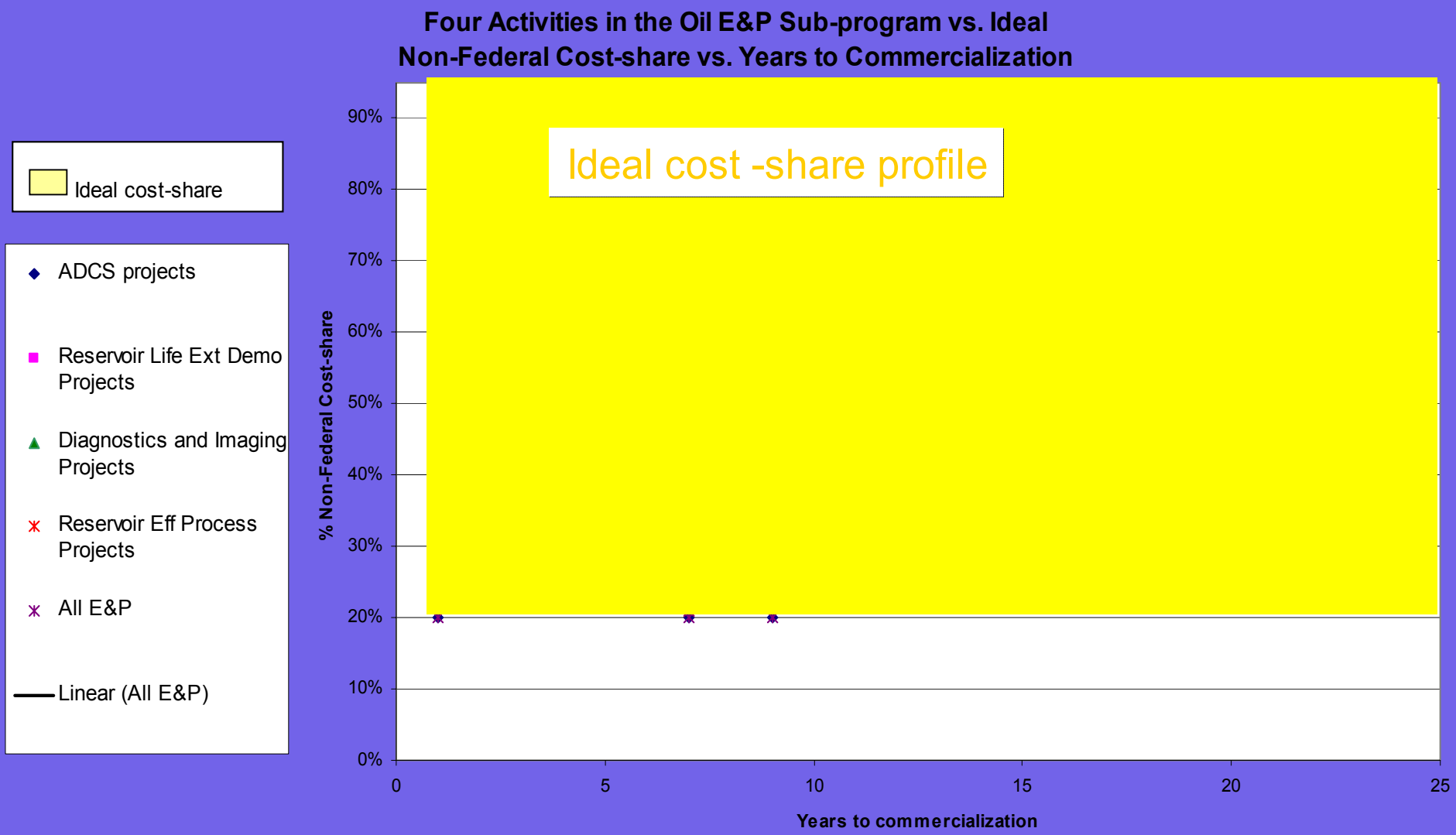
Starting at the lowest level…



…display historical data…

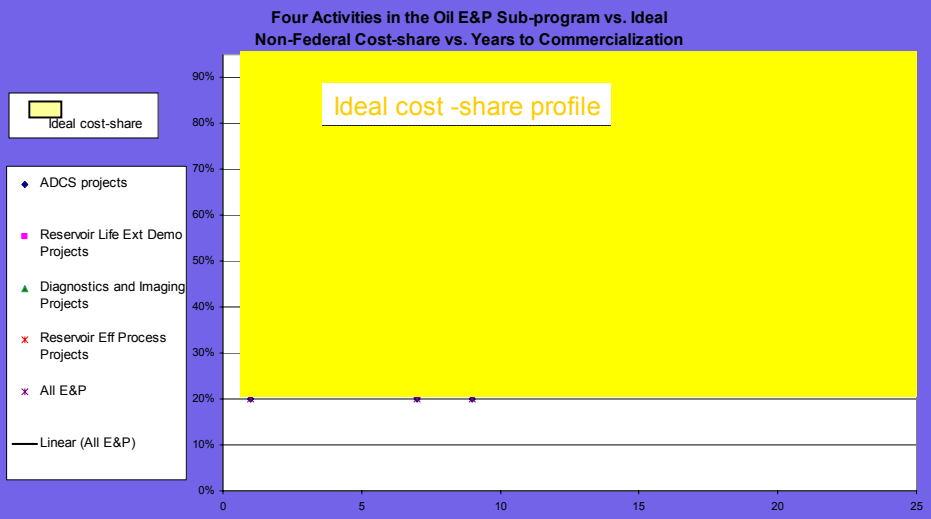


…building to the program level…

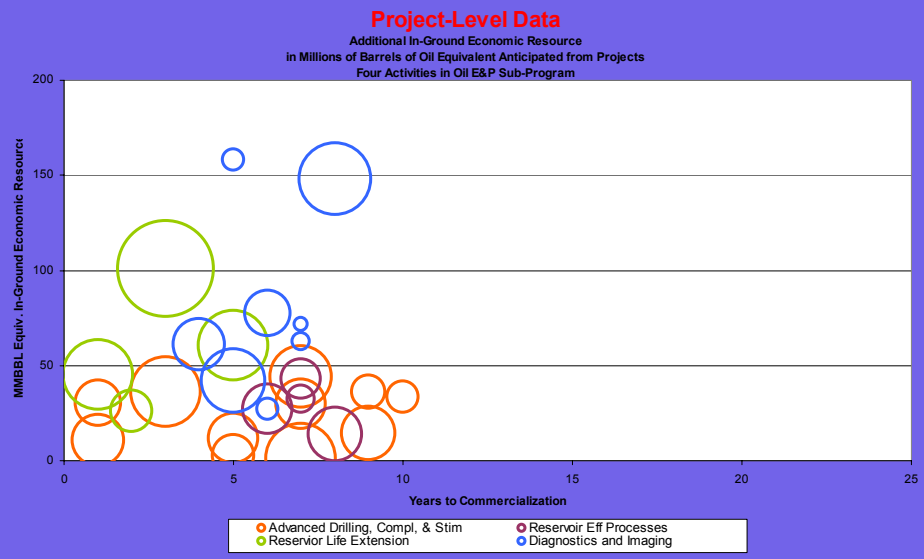


…examining several dimensions…

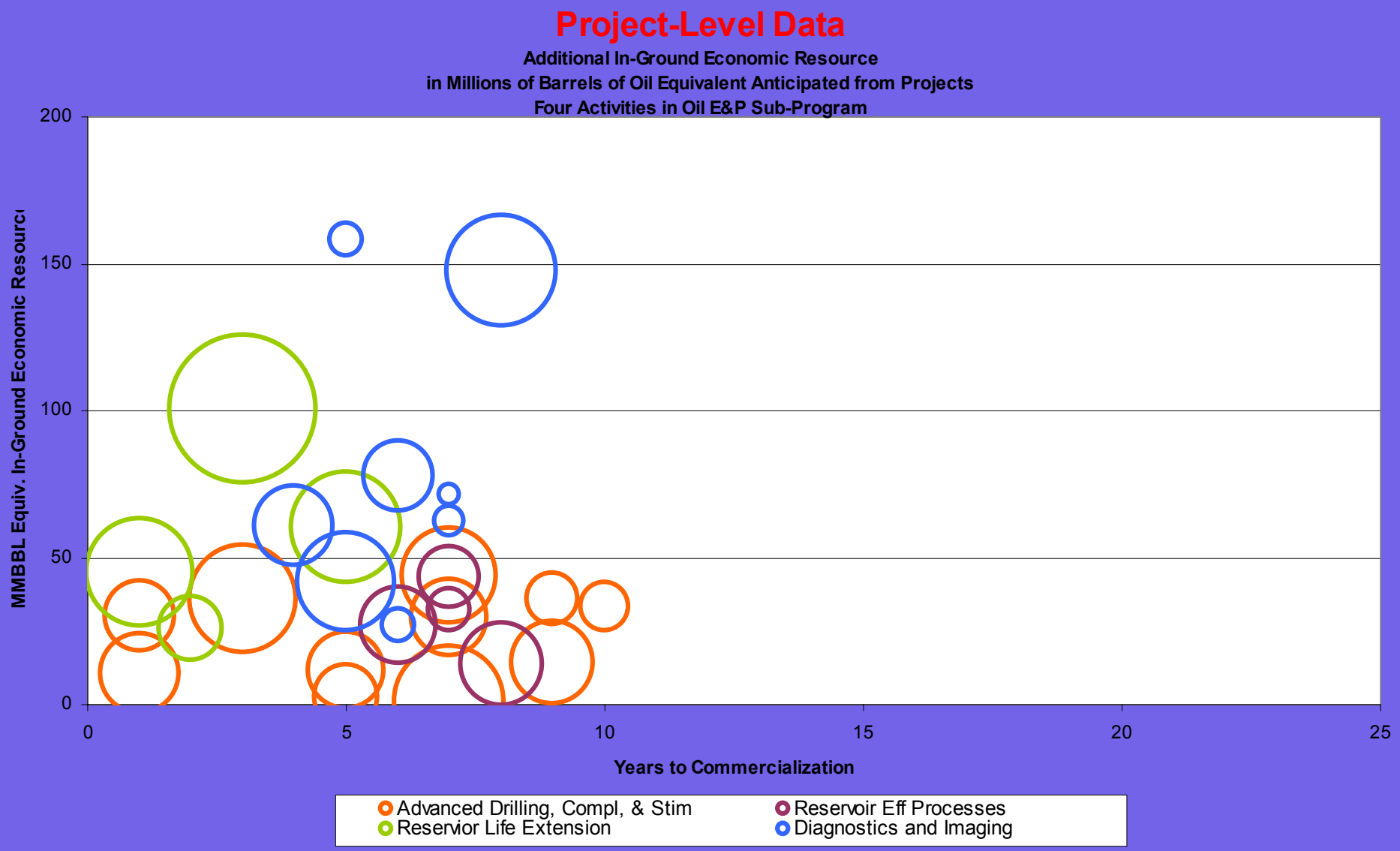
Cost-sharing data



Future Benefits Estimates



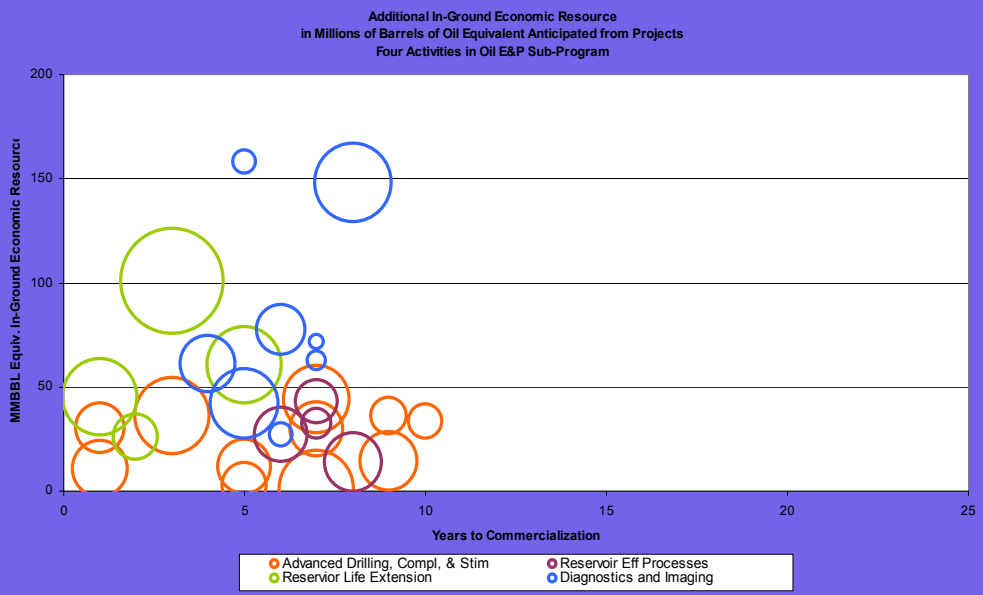
…in sufficient detail…



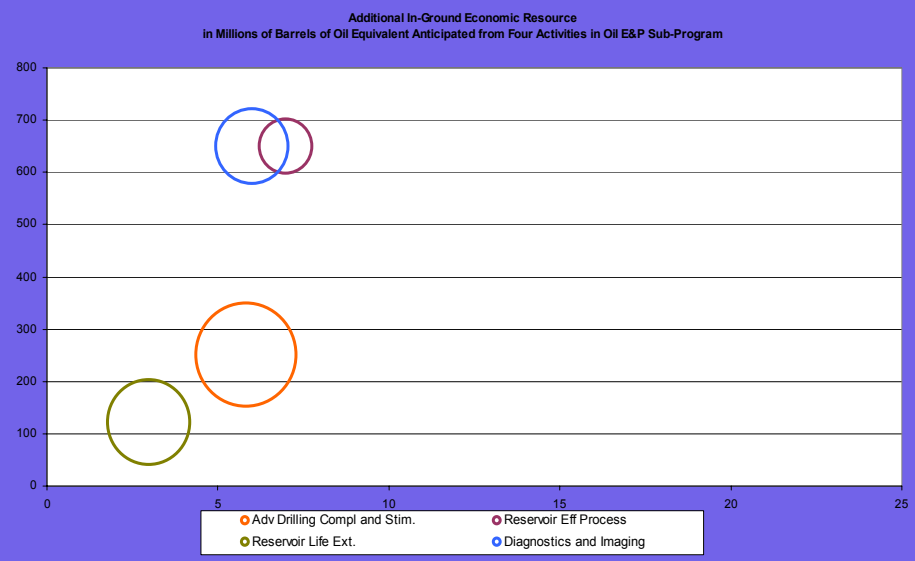
Program vs. Project: Granularity helps analysis

- **While data must eventually be aggregated, information should be available to provide management with information on distribution of project attributes.**

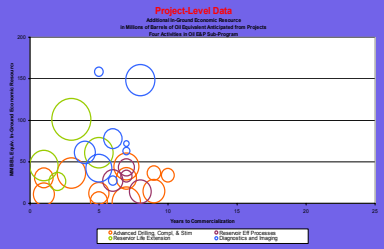
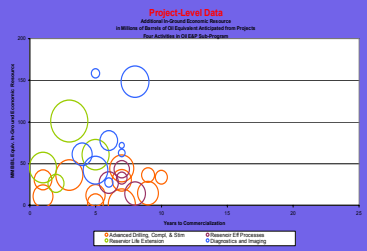
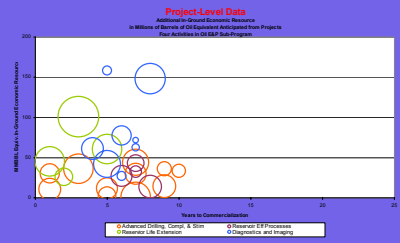
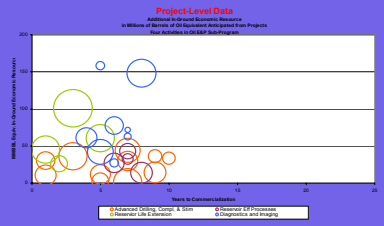
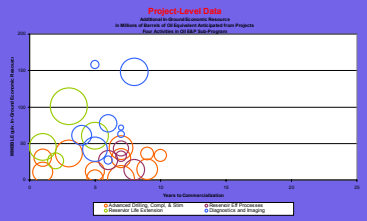
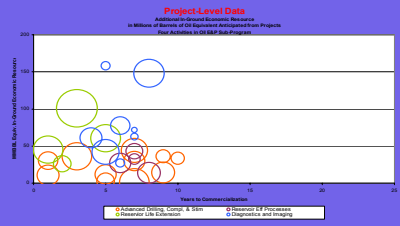
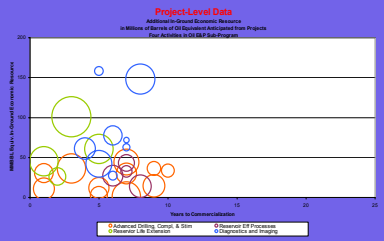
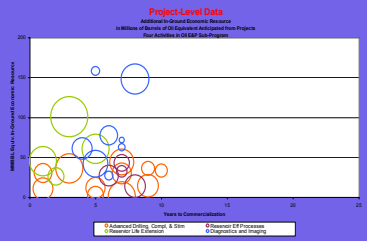
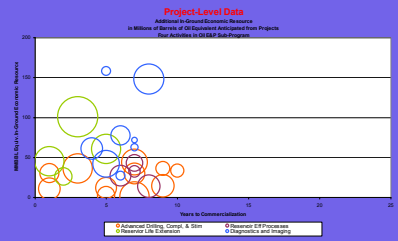
Project-Level Data



Activity-Level Data
(sums project-level)

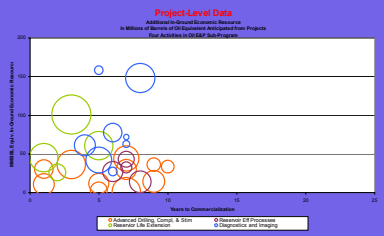
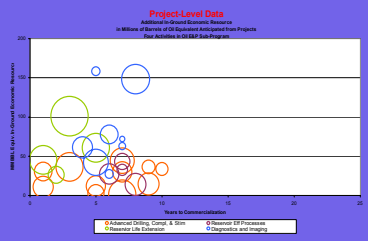
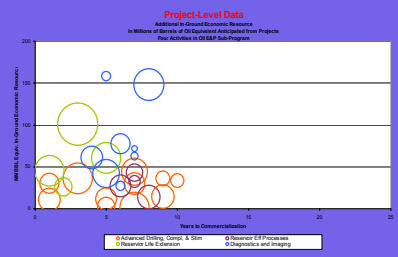
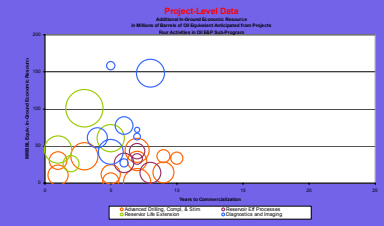
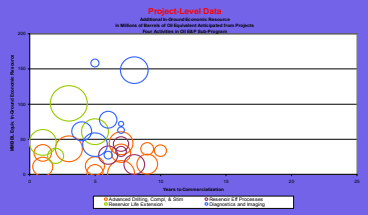
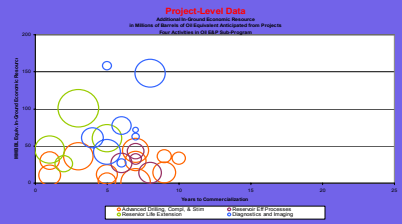
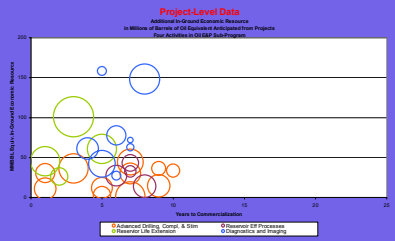
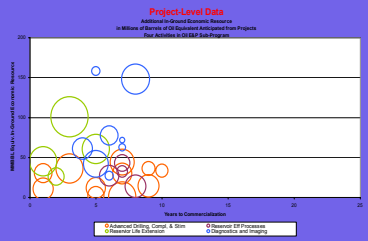
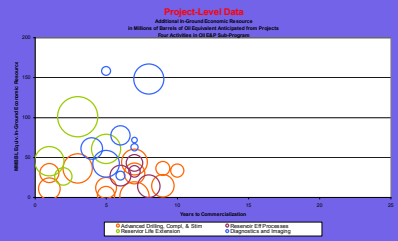


Intra-Program Analysis…

	Security (bbls of oil)	Environment (Tons of CO2)	Economic/ Efficiency
Coal			
Oil			
Gas			

…and Inter-Program Analysis

Scenario One: High Oil Price

	Security (bbls of oil)	Environment (Tons of CO2)	Economic
Fossil			
EERE			
Nuclear			

DOE has improved its analysis over the past two years

- R&D Investment Criteria
  - Relevance (Federal role)
  - Quality (Credible execution plans)
  - Performance (Historical data and credible public benefit projections)
- PART (Program Assessment and Rating Tool)
  - Evaluation function
- IT Support
  - Building a data warehouse for:
    - GPRA, R&D Criteria, PART, budget and accounting

What are the Lessons Learned on R&D Investment Criteria?

- Appropriate level of “Granularity”: varies
- Data Quality: needs improvement
- IT Support: can ease reporting burden and expedite management review
- Relationship between PART and Investment Criteria: needs clarification

What is the Appropriate Level of Granularity?

- Every project in every program should meet the investment criteria
- Reporting level will vary by program
  - Questions need to be tailored to the right level

What Data Quality Problems Exist?

- Costs Estimates
  - Inconsistent assumptions about:
    - Total program cost, "flat" funding, true program profile, sunk costs
- Benefits Estimates
  - Inconsistent methodologies
  - Data gaps
- Other key variables
  - Cost-sharing
  - Time to commercialization
  - Inconsistent use of R&D scoring guidance

Next Steps: Improve Cost/Benefit Estimates

- Goal:
  - Consistent, quality estimates across programs
- Require fixed baseline
  - treat R&D like capital assets for earned-value purposes

Costs Estimates

- Future spending assumptions not explicit or consistent
- Program costs exclude overhead expenses
- Historical cost projections usually not available:
  - Useful for “reality check” of current estimates
  - Cost, schedule and performance baselines

Benefits Estimates

- Contain conflicting assumptions:
  - New technologies often assume capture of same market share
- Must incorporate assumptions about industrial research absent DOE: the “5-year” rule
- Inconsistent metrics
  - e.g. barrels of oil, vs. Kwh, vs. Gton carbon
- Inconsistent dates for measuring benefits
  - If one technology is to commercialize in 2009, and another in 2015, how do we compare benefits
- Inconsistent market penetration estimation methods

Cost-sharing

- Used to:
  1. reduce likelihood of crowding out private R&D funds
  2. market-test technology by measuring industry interest
  3. ensure match to industry needs and specifications
- Effective use requires C-S to be an important element in project selection criteria
  - Current solicitations often target only minimums
- Should increase with project maturity
  - See CFO guidance dated September 13, 2001

Time to commercialization

- Need more independent estimates
  - This is where peer review can make a large contribution
- Should correlate to:
  - Cost-share
  - Technical maturity:
    - Basic research, applied, development or demonstration

Goal: A Balanced Portfolio

Across several dimensions:

- Time
- Public Benefits
  - Environmental
  - Economic/Energy Efficiency
  - Security
- Technical Risk
- Plausible Future Scenarios
  - Covariance between programs: one program's improved benefits offset other's reductions

Summary: Analysis Can Improve Results

- Data helps improve decision-makers understanding and perspective
- Very large amounts of data can be presented graphically
- Every project should fit within investment criteria
- Planning for data collection